State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES
Northern District

RECREATION USE SURVEY OF INDIAN CREEK, PLUMAS COUNTY 1986

Technical Information Report No. 87-1

Prepared under the supervision of

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by

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This report was prepared to summarize information collected under Work Order 1501-0100 to document recreation and fishery enhancement provided by a revised operation of Antelope Reservoir. This report has received only limited review; it is intended for internal use and should be considered preliminary and subject to revision.

June 1987

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SUMMARY

A survey of streamside recreation along upper Indian Creek, Plumas County, was made in 1986. This survey was a follow-up to a five-year program, ending in December of 1982, to estimate the amount and types of recreation occurring with augmented flow conditions. The random sample survey combined roving use counts with interviews of anglers to gather information on recreation use, activities, visitor origin, and angler success.

There were an estimated 27,000 hours of recreation use on upper Indian Creek between April 26 and November 15, 1986. The most frequently observed activities were camping, fishing, relaxing, and gold seeking. About 37 percent of the visitors and 41 percent of the anglers lived in the northeast counties of California, mostly Plumas and Lassen Counties. Anglers caught about 2,700 brown trout and 2,500 rainbow trout in 7,600 hours of fishing on the creek.

General recreation use was about 25 percent greater than the average of the five-year period, 1978-82. However, total fishing use and trout catch were similar to previous years of normal or above normal runoff.

INTRODUCTION

Indian Creek below Antelope Dam offered an opportunity to implement a Department of Water Resources (DWR) water management policy, adopted in 1975, which states, "Instream uses for recreation, fish, wildlife, and related purposes shall be balanced with other uses." When Antelope Dam began operation in 1964, streamflows in Indian Creek below the dam were increased and stabilized. Minimum flows were increased from about 3 cubic feet per second (cfs) to 10 cfs, resulting in a five-fold increase in trout populations several years later (Gerstung, 1973). Presumably, fishing and related recreation along the creek were likewise enhanced. An instream flow needs assessment indicated that 20 cfs would roughly double trout habitat over these post-project levels (DWR, 1979, and Haines, 1981b).

On a trial basis, Antelope Reservoir was reoperated for a three-year period beginning in March 1978 to increase flows in the creek in an effort to enhance recreation and fishery values without significant detriment to lake recreation. Streamflow releases were maintained at 20 cfs during 1978 and 1980 and the effects on recreation were monitored (Cartier, 1979; Haines, 1981a).

Severe drought conditions in northeastern California during winter 1978-79 (spring runoff in Indian Creek was 35 percent of normal) caused the release to be reduced to 10 cfs in January 1979. This was done to assure filling of Antelope Reservoir and to avoid the possibility of an even lower release during summer of 1979. The release from Antelope Dam was maintained at 10 cfs from January 19, 1979, to April 20, 1980, and the effects of this schedule on recreation were monitored (Haines, 1980).

Information obtained during the three-year evaluation was summarized in a Northern District report that recommended the revised operation continue on a permanent basis (Hinton and Haines, 1981). The report also recommended periodic monitoring of recreation use, trout populations, and fishing success in the upper 11 miles of Indian Creek. About 60 percent of the fishing use and 80 percent of the trout catch occurs in this portion of the creek. Monitoring this reach would document changes in recreation use, fish populations, and trout catch resulting from the modified flow release schedule.

This report describes the recreation use survey and creel census conducted along the upper creek during the 1986 trout season, April 26 to November 15. A separate report, prepared by the Department of Fish and Game (DFG), Contract Services Section, will describe a fish population survey conducted in September 1986.

DESCRIPTION OF STUDY AREA

Indian Creek is a major tributary of the East Branch North Fork Feather River in Plumas County. The creek flows from Antelope Dam about 38 miles to its confluence with Spanish Creek near the junction of Highways 70 and 89, about 11 miles northwest of Quincy (Figure 1). The area has a rich history of gold mining, ranching, and lumber production. In recent decades, recreation use has increased rapidly, with water-related uses a major attraction. Employment in the area today is divided among services, government, and timber harvesting and processing. Indian and Genesee Valleys support large cattle ranches.

The survey reach included the upper 11 miles of Indian Creek beginning at Antelope Dam, elevation 4,900 feet, and ending at Flournoy Bridge, elevation 3,700 feet. The upper end of this reach flows through granitic canyon with stands of pine and fir, but is often meadowlike. It is closely followed by a paved road with wide pullouts for convenient stream access. A portion of the creek cuts through a deep and rugged canyon, accessible only by foot, before flowing into the upper part of Genesee Valley. All but the lower one mile is within Plumas National Forest.

The stream remains cold in summer due to deep-water outflow from the dam and is slightly turbid. Brown trout and rainbow trout dominate the fishery. Many rainbow trout and brown bullhead enter the creek from Antelope Reservoir when it spills. Sacramento squawfish and suckers also occur in the lowermost portion of the creek.

Antelope Reservoir filled and began spilling on February 18, 1986, reaching a record release and spill on March 8 at an estimated 950 cfs, following a severe storm in mid-February. Reservoir spill ended on June 20, 1986, and the release controlled at 20 cfs for the rest of the year (except 18 days in September when the release was reduced to 5 cfs to permit fish population sampling).

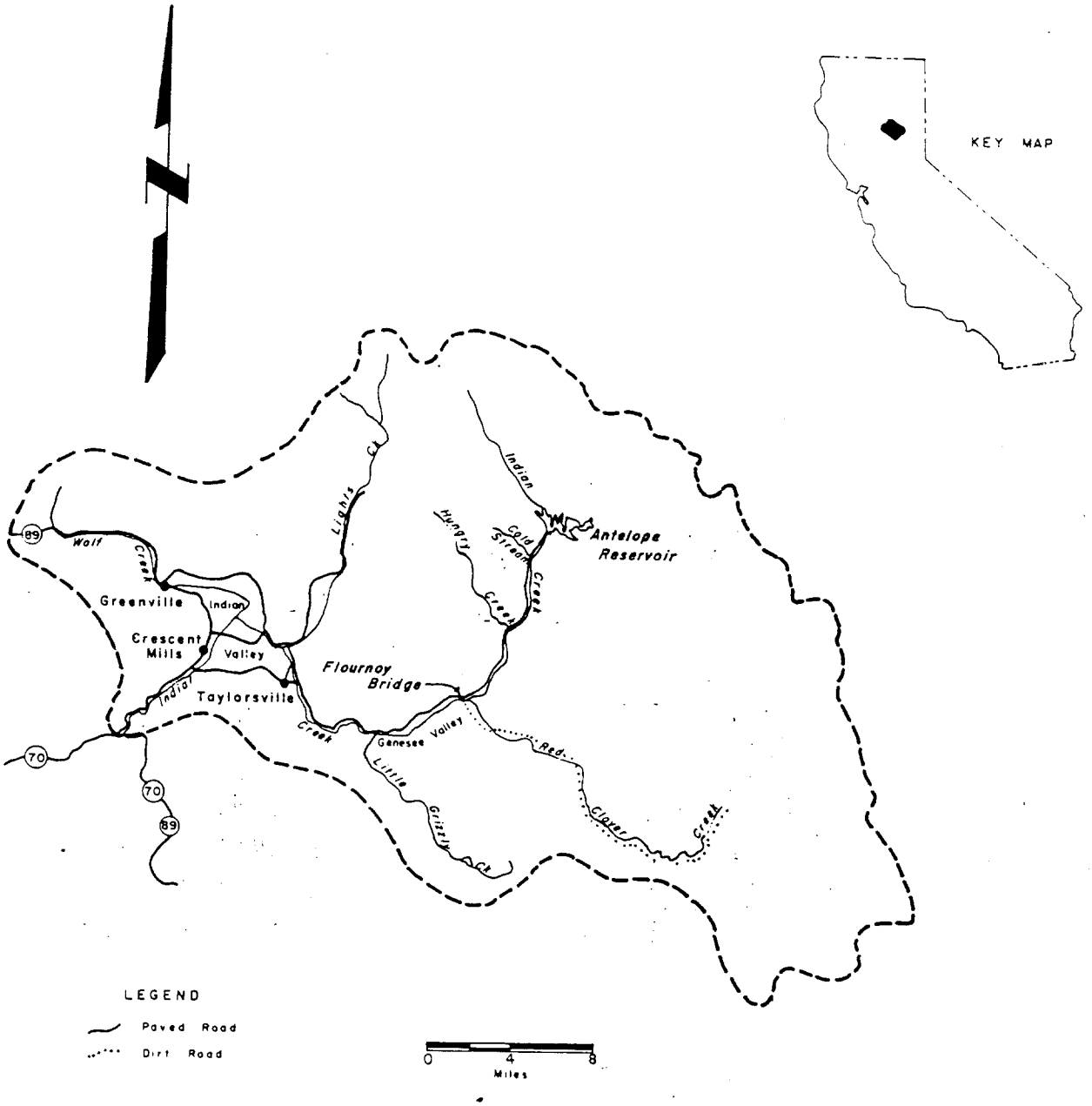

Figure 1 – Antelope Reservoir and Indian Creek, Plumas County, 1986.

METHODS

Recreation Use Counts

Use counts were made on randomly selected dates within nine survey strata using the optimum allocation method described by Abramson and Tolladay (1959). Thirty days of the 204-day period from April 26 through November 15, 1986, were surveyed; both days of the opening weekend of trout season, 5 of 9 holiday weekend days, 14 of 142 weekdays, and 9 of 51 weekend days. Five one-hour counts of recreation use were made in the study area each day at regular periods, scheduled according to the number of daylight hours (Appendices I and II).

The surveys were made from a vehicle or on foot, as necessary, to check access and recreation sites. Recreationists (and their vehicles) were counted and recorded by recreation activity. The five daily counts were totalled and multiplied by factors that accounted for recreation use during the daylight periods not counted. Similarly, the resulting daily figures were expanded to estimate total recreation hours for all days in each stratum. Adding the stratum totals provided an estimate of recreation hours for the study period.

Creel Census

Anglers along Indian Creek were contacted on 37 days to determine fishing success. The county of residence and length of time spent fishing so far that day was recorded for each angler contacted. Fish censused were counted, measured (fork length to nearest 0.5 centimeter [cm]), and identified to species.

To determine total catch, the catch per hour was multiplied by estimated hours of fishing for each stratum. Total weight of trout caught was calculated from estimated total catch and length-weight data from Indian Creek trout (Bumpass and Smith, 1987).

RESULTS

Recreation Use

Total recreation use on upper Indian Creek was estimated at 27,000 recreation hours (± 6,000 hours) for the period April 26 to November 15, 1986. Based on counts of recreationists, camping was the major activity, followed by fishing, relaxing, and gold seeking (Table 1). Use counts reflect what recreationists were doing when seen and the number of hours spent on each major activity, but did not provide data on other activities that people pursued at other times during their stay.

Table 1. Recreation Hours by Activity
Upper Indian Creek, 1986

Activity	Recreation Hours	Percent
Camping	9,700	36
Fishing	7,600	28
Relaxing	5,300	20
Gold Seeking	1,900	7
Miscellaneous/Other*	2,500	9
Total	27,000	100

* Includes children playing, walking, swimming/beach use, sightseeing, picnicking, and miscellaneous other activities.

In addition to the use counts, 413 interviews of recreationists were conducted during the 1986 season, representing 1,065 people. The interviews provided more detailed information on activity participation and additional information on visitor characteristics. About 64 percent of the recreationists interviewed said they fished during their visit to Indian Creek, and about 50 percent said they were relaxing. Other activities included walking for pleasure (27 percent), swimming or wading (19 percent), picnicking (16 percent), beach use (14 percent), and sightseeing (13 percent). About 20 percent of the people interviewed mentioned miscellaneous other activities. These percentages total more than 100 percent because many people engage in more than one activity.

About 42 percent of the visitors camped along Indian Creek, 33 percent were day users and returned home at night, and 25 percent stayed overnight somewhere in the area, but not at Indian Creek. Most of these camped at Antelope Reservoir, but a few stayed with friends or relatives in the area, at motels or resorts, private campgrounds, or summer cabins.

As in previous years, most recreational visitors to Indian Creek came from the northeast counties, San Francisco Bay area, and Sacramento Valley (Figure 2).

Creel Census Data and Angler Success

During the 1986 trout season, 485 anglers were contacted. They had fished 973.75 hours, with a recorded catch of 356 brown trout (Salmo trutta) and 374 rainbow trout (Salmo gairdneri). In addition, a total of 171 other trout were reported caught, or reported to have been caught and released. Total angling use was estimated at 7,600 (± 1,500 hours) or 2,800 angler days, with an estimated catch of 2,700 brown trout and 2,500 rainbow trout. Based on reported catch, and reported catch and release, as many as 300 additional trout may have been caught and 1,000 more trout may have been caught and released. No other species of fish were observed or reported to have been caught this year.

More than 77 percent of the anglers censused fished with bait, about 12 percent with lures, and the remaining 11 percent with flies.

The mean length of brown trout caught during 1986 was 24.1 cm (9.5 inches [in]) with a range of 14.5 to 56 cm (5.7 to 22 in) (Appendix III). The mean length of rainbow trout was 28.4 cm (11.2 in) with a range of 14 to 39.5 cm (5.5 to 15.5 in) (Appendix IV). An estimated 1,000 lb of brown trout and 1,300 lb of rainbow trout were caught. Two brown trout measuring 56 cm (22 in) and 55 cm (21.7 in) in length were the largest fish observed this year. Both were caught in mid-May (May 10 and 18).

Indian Creek angler origin was similar to previous years; most of the anglers came from the northeast counties, San Francisco Bay area, and Sacramento Valley (Figure 3).

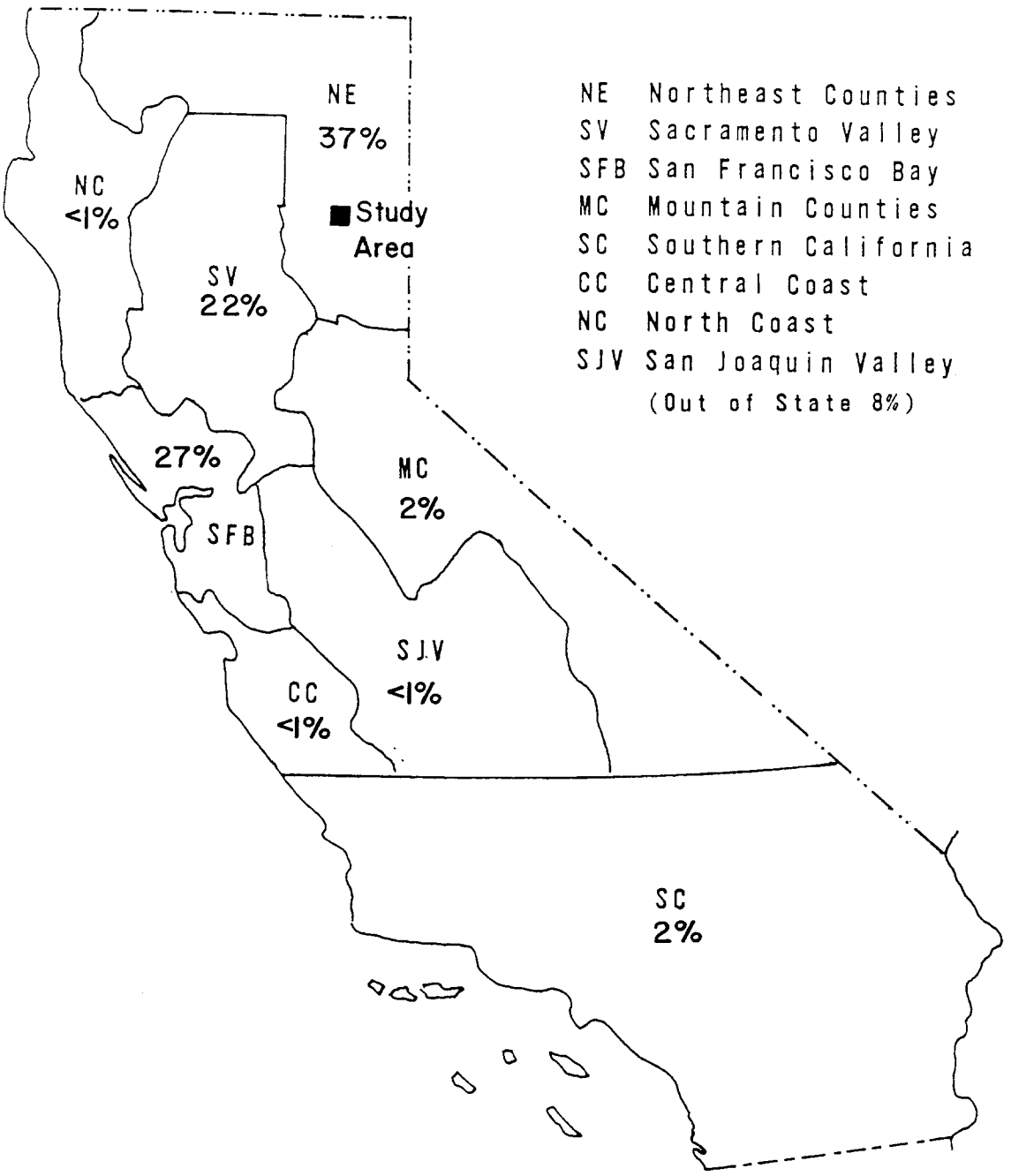

Figure 2 - Indian Creek Visitor Origin by County Groups 1986

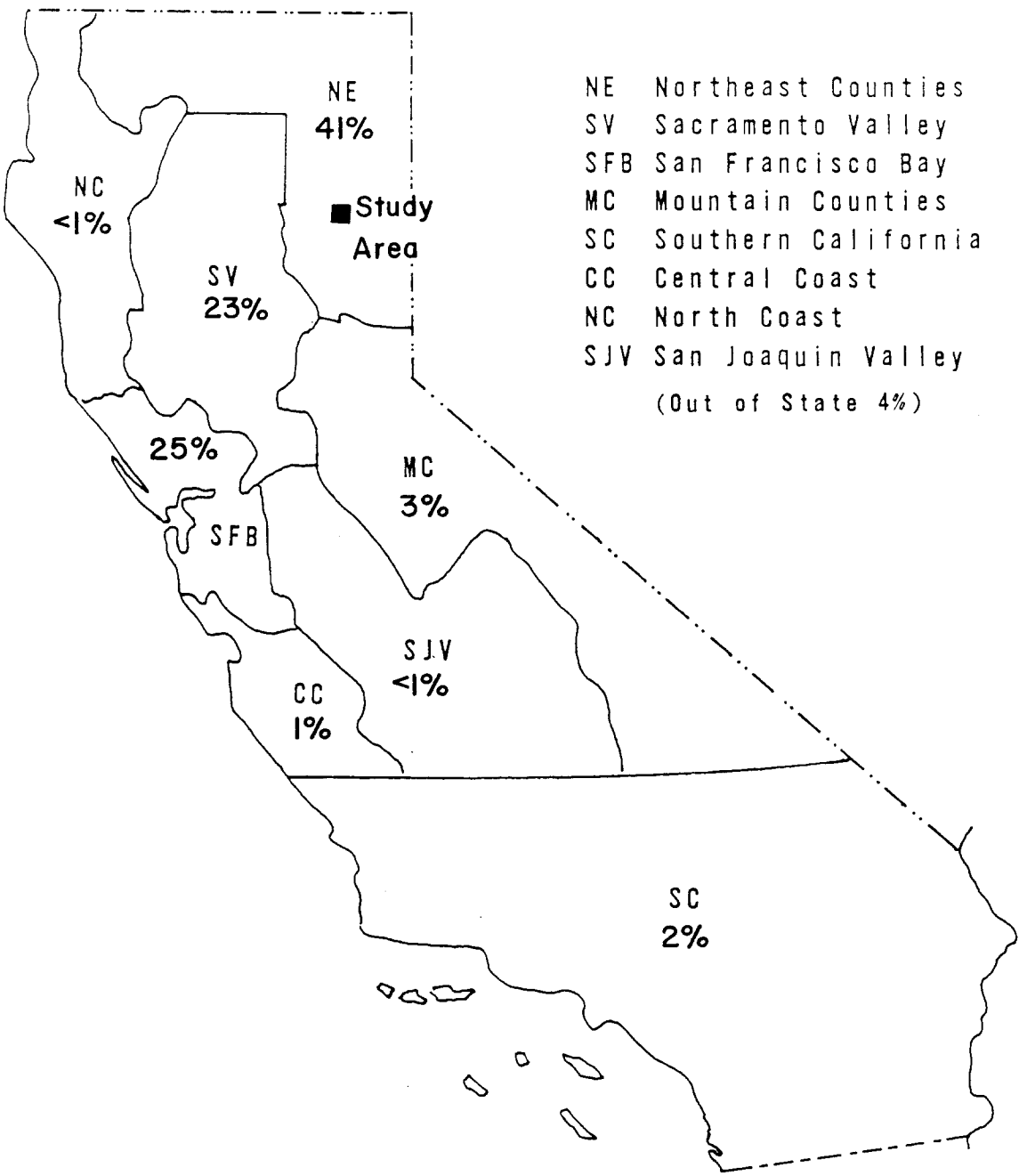

Figure 3- Indian Creek Angler Origin by County Groups 1986

DISCUSSION

Understanding the limitations of the recreation use survey and creel census helps put the data obtained in perspective. This section describes the survey limitations and compares data from previous years with 1986 data.

Limitations of Use Counts and Creel Census

Most recreationists on the creek were readily observed during the use counts. Vehicle access points were checked on each count, but people were not found for some vehicles. Vehicles of U. S. Forest Service workers, loggers, and other non-recreationists often park along the road in this reach of Indian Creek, making vehicle counts a poor index of recreation use. Six to ten loggers, truck drivers, and construction workers periodically camped at suitable locations along Indian Creek during the summer. We subtracted these "campers" from the recreation use counts and did not include them in the estimates of use because they were usually not at their campsites during the day and generally did not engage in recreation along the creek. However, from counts of vehicles not associated with people, it appears the estimate of total recreation use could be about 10 percent low, a figure lower than previous years. About 13 percent of the estimated fishing use was represented in the creel census.

Comparison of 1986 Results with Previous Surveys

The first three surveys of Indian Creek (1978-80) covered the entire stream. In 1981, 1982, and 1986, the survey included only the upper 11 miles of the creek. A comparison of data from all six years illustrates changes that have occurred in general recreation, fishing, and angler success in this reach.

General recreation in 1986 was about 25 percent greater than the average use of the previous five years surveyed. Fishing use was only slightly higher than the five-year average. Gold seeking increased greatly--more than three times the average of previous years.

Two events probably reduced overall use for the year. Due to high fire hazard, the U. S. Forest Service restricted campfire and stove use for the entire forest beginning August 18, 1986. Flooding and subsequent damage and

repair closed Highway 70, a major highway access to the area, from February 17, 1986, to about July 1, 1986, with lengthy closures after Labor Day and through the remainder of the year.

Gold seeking probably increased due to a belief that more gold was exposed and deposited than in previous years due to peak flows in March 1986.

Table 2. Estimated Recreation Hours by Activity
Upper Indian Creek, 1978-82 and 1986*

Activity	Year					
	1978	1979	1980	1981	1982	1986
Fishing	7,000	3,400	8,800	3,600	13,500	7,600
Camping	5,600	7,700	8,000	4,500	14,500	9,700
Relaxing	4,200	5,200	2,600	2,000	3,000	5,300
Picnicking	300	500	700	800	1,400	200
Gold Seeking	300	200	400	1,600	600	1,900
Miscellaneous/Other	1,200	1,000	1,700	1,000	2,600	2,300
Total	18,600	18,000	22,200	13,500	35,600	27,000

* Source: DWR Technical Information Report Nos. 79-1, 80-1, 81-1, 82-1, 83-1, and this report.

Six years of surveys, a period that included a wide range of stream-flow conditions, have revealed that in years with large spills from Antelope Reservoir when summer flows are maintained at 20 cfs, angling success is higher and more anglers are attracted to Indian Creek than during years with low flows. Anglers know that rainbow trout leave the reservoir when it spills and fishing will be good downstream. The catch per hour and total catch of rainbow trout roughly reflect the number of trout entering the stream at the time of spill. Fishing success for brown trout remains about the same irrespective of angling pressure. After spill ends, the higher maintained flows make the stream appear better for fishing and increased angler use continues. Higher use then results in even more trout caught.

Table 3. Streamflow and Estimated Angler Use and Catch Upper Indian Creek, 1978-82 and 1986*

Year	Streamflow Conditions	Angler Hours	Brown Trout # BN Caught	Brown Trout Catch/ Hour	Rainbow Trout # RT Caught	Rainbow Trout Catch/ Hour	Total Trout # Trout Caught	Total Trout Catch/ Hour
1978	Spill 46 days and 20 cfs	7,000	3,465	0.50	1,400	0.20	4,865	0.70
1979	Spill 20 days and 10 cfs	3,400	1,330	0.39	410	0.12	1,740	0.51
1980	Spill 177 days and 20 cfs	8,800	2,950	0.34	2,835	0.32	5,785	0.66
1981	No spill and 10 cfs	3,600	1,400	0.39	200	0.05	1,600	0.44
1982	Spill 237 days and 20 cfs	13,500	4,300	0.32	4,780	0.35	9,080	0.67
1986	Spill 123 days and 20 cfs	7,600	2,700	0.35	2,500	0.33	5,200	0.68

* Source: DWR Technical Information Report Nos. 79-1, 80-1, 81-1, 82-1, 83-1, and this report.

The six years of survey data have defined Indian Creek recreation and fishing quite well and also provided some interesting incidental information. Use is normally heaviest in the spring months and about 50 percent of the annual recreation and 70 percent (79 percent in 1986) of the fishing occurs by the end of June. The major activities are typically camping, fishing, and relaxing. Overall, the best fishing occurs before July. Fishing is usually best in the morning hours (before noon for both rainbow and brown trout, although evening fishing (after 4 p.m.) for brown trout is nearly as good. Morning and evening periods nearly always provide better fishing than mid-day.

Most of the exceptionally large fish observed in the creel census are caught on the opening weekend or early in the season. The opening weekend always has the highest angling use of the year, but often not the highest fishing success.

Local anglers (Plumas and Lassen County residents) who presumably know Indian Creek better than other anglers are somewhat more successful in catching trout than residents of other counties.

ACKNOWLEDGMENTS

Graduate Student Assistants Greg Grimm and the author and Student Assistants Jennifer Voester and Carol Janeway conducted the use counts, creel censuses, and interviews. Special thanks go to Greg, who also assisted the author in preparing survey materials and continually re-evaluating and clarifying methods and implementation techniques in order to assure accuracy and consistency of details.

Thanks to Cliff Maxwell and Shawn Thomas, who drew the maps and graph, and Diane McGill, who typed the text and tables.

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APPENDIX I

RECREATION SURVEY SCHEDULE FOR
INDIAN CREEK, PLUMAS COUNTY
APRIL 26, 1986, TO NOVEMBER 15, 1986

Indian Creek Survey Dates	Holiday = HD Weekend = WE Weekday = WD	Survey Strata
April 26	WE	I
April 27	WE	I
May 2	WD	IV
May 9	WD	IV
May 10	WE	III
May 13	WD	IV
May 18	WE	III
May 24	HD	II
May 25	HD	II
May 26	HD	II
June 3	WD	IV
June 4	WD	IV
June 8	WE	III
June 17	WD	IV
June 21	WE	III
June 27	WD	IV
July 2	WD	VI
July 5	HD	IX
July 13	WE	V
July 18	WD	VI
July 26	WE	V
July 28	WD	VI
August 6	WD	VI
August 17	WE	V
August 19	WD	VI
September 1	HD	IX
September 14	WE	VII
September 24	WD	VIII
October 20	WD	VIII
November 1	WE	VII

APPENDIX II

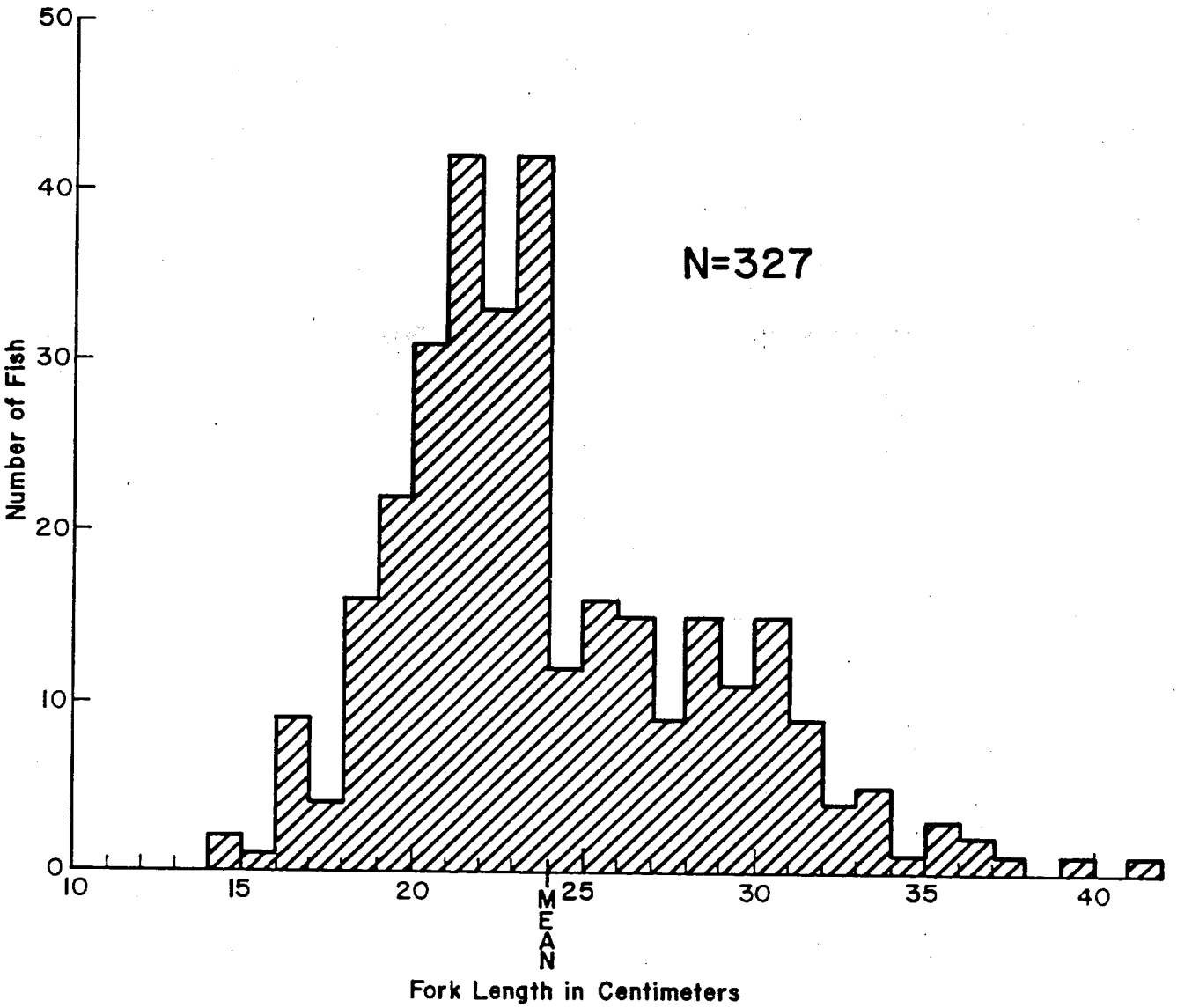
1986 USE COUNT SCHEDULE FOR INDIAN CREEK

Date	Daylight Hours	Use Count		Creel Census Time (approx.)
		Count	Time	
April 26		1st	0630-0730	0730-1200
PST	15-1/2	2nd	0900-1000	1300-1730
		3rd	1200-1300	
		4th	1430-1530	
		5th	1730-1830	
April 27		1st	0730-0830	0830-1300
DST	15-1/2	2nd	1000-1100	1400-1800
		3rd	1300-1400	
		4th	1530-1630	
		5th	1830-1930	
May-August		1st	0700-0800	0800-1300
DST	16-1/2	2nd	1000-1100	1400-1900
		3rd	1300-1400	
		4th	1600-1700	
		5th	1900-2000	
September		1st	0730-0830	0830-1230
DST	14	2nd	1000-1100	1330-1730
		3rd	1230-1330	
		4th	1500-1600	
		5th	1730-1830	
October		1st	0800-0900	0900-1230
DST	13	2nd	1000-1100	1300-1700
		3rd	1230-1330	
		4th	1500-1600	
		5th	1700-1800	
November		1st	0730-0830	0830-1130
PST	12	2nd	0930-1030	1230-1530
		3rd	1130-1230	
		4th	1330-1430	
		5th	1530-1630	

Appendix III

Length Frequency of Censused Brown Trout, Indian Creek, 1986

Plus one fish each
44.5, 55, 56 and
two at 46 centimeters



Appendix IV

Length Frequency of Censused Rainbow Trout, Indian Creek, 1986